Is There a Benefit to Drains With a Kocher-Langenbeck Approach? A Prospective Randomized Pilot Study

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Background: Closed suction drainage is a routine part of wound management for patients undergoing surgical treatment of acetabulum fractures. This pilot study seeks to determine if there is a difference in wound healing for a Kocher-Langenbeck approach with and without the use of drains.

Methods: We conducted a prospective, randomized study including 39 patients with acetabulum fractures treated through a Kocher-Langenbeck approach. During wound closure, patients were randomized into two groups: 20 patients (group I) received drains and 19 (group II) were closed without drains. All were followed up for drain output, quality and quantity of drainage, signs of infection, and duration of drainage. Patients were then evaluated at 2 weeks and 8 weeks for wound healing and any signs of infection.

Results: By the 8-week follow-up, all wounds healed without any signs of infection. There was no difference in the average number of days of drainage between groups: 7.45 days and 7.95 days for group I and group II, respectively ($p = 0.37$). There were two wound complications (5.13%), with one in each group. Both complications consisted of cellulitis without signs of deep infection and had complete resolution with intravenous antibiotics. A post hoc power analysis determined that a test population of 1,264 patients would be needed to show a reduction in wound drainage time by 1 day.

Conclusion: With the numbers available in this pilot study, we showed no benefit to the use of drains for acetabular surgery performed through a Kocher-Langenbeck approach.

Key Words: Surgical drains, Suction drainage, Kocher-Langenbeck.

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Closed suction drainage has traditionally been included as a routine part of postoperative wound management for patients undergoing surgical treatment of acetabulum fractures. Several studies in the spine and arthroplasty literature have raised the question of the effectiveness and necessity of the routine use of drains in clean cases.[1–14] However, many acetabular fracture surgeons still believe the need to place drains to avoid postoperative hematomas and other wound complications.[15] The purpose of this study is to analyze whether there is a difference in wound healing and infection rates for patients undergoing open reduction and internal fixation of acetabulum fractures through a Kocher-Langenbeck (K-L) approach with and without the use of closed suction drains.

MATERIALS AND METHODS

After approval from our institutional review board, we conducted a prospective, randomized clinical trial over a 1-year period including patients with acetabulum fractures treated through a K-L approach. The study was conducted in a single university setting, with a single senior surgeon. Two hospital sites were included: a private university hospital and a state hospital. During the inclusion period, there were 42 acetabulum fractures treated through a K-L approach. Three patients refused to consent to the study. The remaining 39 patients, 11 women and 28 men, were included in the study. The average age was 37.8 years (range, 17–76 years).

There were 20 patients with posterior wall fractures. Ten were classified as transverse plus posterior wall. Seven patients had posterior column plus posterior wall fractures, and two were T-shaped. Two patients had femoral head fractures associated with their posterior wall fractures. One patient had an open fracture with communication between the rectum and the hip joint.

All patients underwent open reduction and internal fixation through a K-L approach (Fig. 1). All approaches and closures were performed by a resident or fellow. Two approaches required the additional exposure of a trochanteric flip osteotomy. Just before wound closure, during pulse lavage of the wound, patients were randomized to drain versus no drain by opening a sealed envelope. The decision for postoperative radiation was made at the discretion of the senior author before randomization to a study group.

Twenty patients (group I) received drains consisting of two large Hemovac drains (Zimmer, Warsaw, IN): one placed beneath the fascia lata and one just superficial to the fascia. Nineteen patients (group II) were closed without drains. The patient with the open fracture was randomized to group I. Both patients with trochanteric flip osteotomies were random-

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Figure 1. Postoperative radiographs after open reduction and internal fixation through a K-L approach.

ized to group II. Twelve patients underwent postoperative radiation, six in each group.

Both groups received routine postoperative care per protocol previously established and practiced by the senior author. This included intravenous first generation cephalosporin until all drainage from the wound stopped. All patients were on mechanical deep venous thrombosis prophylaxis only until the drains were removed. After drain removal, patients received fractionated heparin subcutaneously twice a day until hospital discharge. Subcutaneous fractionated heparin began on postoperative day (POD) 3 for patients without a drain. Drains were removed individually when their recorded output was less than 20 mL per 8-hour shift or there was decreasing output by POD 5. The operative dressing was left in place for 48 hours and then changed daily.

For purposes of this study, all patients were followed for drain output (if applicable), quality of drainage, erythema, and signs of infection. Drainage was quantified through POD 7 in the following manner. Each wound was initially dressed with three Combine ABD Pads (DUKAL, Hauppauge, NY). Starting on POD 2, patients underwent daily dressing changes with replacement of the three Combine ABD Pads. Daily recordings were made of the number of soaked pads. Per protocol of the senior author, all patients remain in the hospital until all drainage from the wound stopped. The POD on which the drainage stopped was recorded.

Patients were then evaluated by one or both of the two primary authors at 2 weeks and 8 weeks postoperative for wound healing and any signs of infection (Figs. 2 and 3). The surgical incisions were specifically inspected for signs of wound separation, erythema, induration, drainage, and warmth. In addition, patients were questioned for local and constitutional symptoms of infection. All postoperative complications were recorded.

Student's *t* tests were used to test for significant differences between patients with drains and no drains. Levene's test for equality of variance was used to determine that which

Figure 2. Wound check 2 weeks after surgery.

t test was used for determining significance between groups. Fisher's exact test was also used for testing differences in rates of patients requiring revision versus those that did not.

RESULTS

Statistical analysis of patient demographics showed that the groups were well matched. There were no significant differences between the groups (sex, radiation, and fracture type). There was a trend toward younger patients in group I (drain) with an average age of 34.3 years versus group II (no drain) with an average age of 43.8 years ($p = 0.09$). At the 8-week follow-up, all the wounds had healed without any signs of infection.

There was no significant difference between the average number of days of drainage between the two groups: 7.45 days and 7.95 days for group I and group II, respectively ($p = 0.37$). All drainage was serosanguinous. Two (5%) of the 40 drains placed in group I were completely ineffective with zero recorded drain output. The amount of Hemovac drainage correlated with length of drainage (in days). Patients whose total Hemovac drainage totaling <200 mL had wound drain-

Figure 3. Healed incision 8 weeks after surgery.

age averaging 5.3 days; patients with Hemovac drainage between 200 mL and 300 mL drained approximately 7.7 days; those with outputs >300 mL drained approximately 12 days ($p < 0.05$). There was no difference in the quantity of drainage from the incision throughout the postoperative period, with an average of 1.13 soaked pads/patient/d in group II versus 1.06 soaked pads/patient/d in group I ($p = 0.614$).

There was a trend for wounds in patients receiving radiation, regardless of group, to drain more days than nonradiated patients, 8.9 days and 6 days, respectively ($p = 0.065$). Patients with drain and receiving radiation (6 patients) drained longer than the patients without drains receiving radiation (6 patients), 10.4 days to 7.19 days, but this was not statistically significant ($p = 0.21$). Two patients from group I continued serosanguinous drainage from the incision beyond their admission to the acute care hospital. They were transferred to a rehabilitation center where their drainage was recorded according to the study parameters.

There were four complications in the study (10%). Two patients, both in group II, had a loss of reduction, requiring reoperation. Surgical wounds healed without incident before revision. Another two patients (5%), one in each group, were readmitted for cellulitis. Both had complete resolution with intravenous antibiotics. These two patients represented our only wound complications. By the 8-week follow-up, neither patient had any signs of infection.

A post hoc power analysis was performed to determine the sample size that would potentially be required to achieve statistical significance between patients with and without a drain. Given a mean time for drainage to stop in this cohort, we tested the hypothesis that drain use would decrease the mean time to drainage stop to 6 days. This would test a reduction of 14% in the drain group versus the no drain group. This analysis revealed the need for a test population of 1,264 patients (634 in each drain/no drain group) to achieve significance.

DISCUSSION

Routine use of closed suction drains is advocated by many in orthopedic surgery with the justification that wound healing is improved by draining hematoma and seroma, as well as helping to collapse dead space. This has also been the tradition in acetabular surgery.[15] Some acetabular surgeons cite the frequent presence of damaged and contused muscle about the hip as an additional reason for the use of drains.

Closed suction drains cannot be used without the risk of drain-related complications such as colonization of the drain tract and drain retention/breakage.[16–19] In fact, previous studies have shown an increased infection rate with the use of drains.[20,21] In addition, some patients have reported increased complexity of therapy with drains in place and pain on drain removal.[22] Aside from patient factors, the cost of the drain also has to be considered. The type of drain we used in our study has an approximate cost of $150.00 per drain.[11]

Parker et al.[1] recently published a meta-analysis of all randomized clinical trials comparing the use of closed suction drainage to no drain in elective hip and knee arthroplasty patients. They identified 18 studies involving more than 3,000 patients. The data showed no significant difference between groups with respect to wound infection, hematoma, or reoperation for wound complications. They did find a significantly increased need for blood transfusion in patients treated with drains (relative risk, 1.43; 95% confidence interval, 1.19–1.72). Similar results have been shown in analysis of all types of clean orthopedic surgery to include trauma.[4,7,23]

This study is limited by the fact that although all acetabulum fractures treated through a K-L approach over a 1-year period were included, the study size only totaled 39 patients. Although there is no published data regarding infection rate specifically for a K-L approached fracture, it is most likely between 2% and 12% in ideal circumstances.[24–27] By using Letournel's deep infection rate of 4.2% (9 of 213), we would need 16,654 patients (8,327 per group) to show a statistical difference between groups, assuming suction drainage reduces the rate of deep infections by 20% ($p < 0.05$). Furthermore, as previously mentioned, we would need 1,264 patients (632 per group) to show a reduction by 1 day in the length of wound drainage in the suction drainage group, given that drainage stopped on average on POD 7 ($p < 0.05$). Other factors, such as patient comorbidities, demographics and intraoperative findings, may influence the wound outcome in addition to the use of a drain. These were not examined in this study.

With the numbers available in this pilot study, we showed no benefit to the use of drains for acetabular surgery performed through a K-L approach. A multicenter, prospective randomized clinical trial involving over 1,000 patients would be needed to show a decrease in drainage time by 1 day and over 16,000 patients would be needed to show a decrease in the infection rate.

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